Space Weather Forecast

Issued on Saturday, 11 May 2024 at 12:06 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G4 (Severe) Geomagnetic storms reaching Severe levels expected Days 1 and 2 with a chance of continuing into Days 3 and 4. Further R3 (Strong flares) likely.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has remained high in the past 24 hours, with X-ray activity showing frequent Moderate-class activity, peaking with a couple of Strong flares from the large region in the southwest. There are currently eight sunspot groups on the disc. New regions appeared in the southeast disc as small features. The region in the southwest is the largest and most complex region. There has been consolidation of the broader penumbral area and notable relative movement between the various mixed polarity spots, presenting large magnetic shear and further potential for large flares. There are further Earth directed coronal mass ejections that are due to arrive in the next 24 hours.

Solar Wind / Geomagnetic Activity: Solar winds were at slightly elevated levels but increased following the passage of the first CME at 10/1639 UTC. Speeds jumped to strong levels, around 700km/s, with a further spike observed with the arrival of the second CME after 10/2139 UTC. Peak speeds of 804km/s (very strong) were observed at 10/2212 UTC. The Interplanetary Magnetic Field was at weak levels until the passage of both CMEs. Very strong values were recorded following both CME arrivals, the second being stronger. The important north-south component was weakly variable early on, but predominantly very strongly negative (southward) Bz following both CME arrivals.
The net result of the above solar wind measures was Quiet to Unsettled geomagnetic activity early in the period, increasing to Severe between 10/1500-2100 UTC, then an Extreme interval 10/2100-10/2400 UTC, followed by Severe levels of geomagnetic activity.

Energetic Particles / Solar Radiation: Solar radiation levels showed an upward trend in the wake of recent strong flares, rising to Moderate storm levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Further Strong flares are probable in the coming days with frequent Moderate flares expected, primarily from the large sunspot region in the southwest disc, but perhaps also contributed to from new eastern solar horizon arrivals.

Solar Wind / Geomagnetic Activity: Recent CME arrivals have significantly increased geomagnetic activity and solar wind speeds (strong) and further CMEs are expected to follow in the coming days. Two large flares from the large sunspot in the southwest disc on 09 May resulted in Earth-directed CMEs. The faster, second CME is forecast to merge with the preceding CME resulting in a combined front arriving late Day 1 (11 May) or early Day 2 (12 May). Another much slower CME was observed leaving the sun following another large flare of the same sunspot region on 10 May. Yet another fast moving CME from the large early morning flare is due to impact Earth on Day 2 (12 May).
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Geomagnetic activity is expected to be at G4/Severe (Kp8) levels initially on Day 1 (11 May). Activity should erratically subside on Day 1 (11 May), but become enhanced again following the combined arrivals of the two CMEs late Day 1 (11 May), or more likely early Day 2 (12 May). Peak G3-G4/Strong-Severe levels of activity are anticipated, with a small chance of G5/Extreme levels. In the absence of further incoming CMEs activity should further wane though Days 3 and 4 (13 and 14 May), however confidence by the end of the period is low and the forecast may change should further large Earth-directed CMEs occur.

Energetic Particles / Solar Radiation: Solar radiation levels are at S2/Moderate Storm levels and should be maintained into Day 1 (11 May) at least, with a somewhat uncertain decline projected in the absence of any further significant flaring from the large sunspot in the southwest disc. The region is, however, moving into a more favourable location for proton response in the coming days. There is a chance of S3/Strong or greater levels on Days 1 and 2 (11 and 12 May) reducing to a slight chance on the remaining days, although this could change following any further large flares from this region.

Aurora Forecast:
Multiple Coronal Mass Ejections (CMEs) arrived at Earth Friday night and aurora has been observed across the UK and to lower latitudes. Activity will most likely remain enhanced this coming night into Sunday 12 May. Aurora is still likely to be seen across the northern half of the UK and potentially further south again.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	100	95	60	50
Strong	G3	Yes	100	90	40	10
Severe	G4	Yes	95	60	20	1
Extreme	G5	Yes	50	20	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	95	95	95	95
Very Active	R3 to R5 X	Yes	60	50	50	50

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	80	60	40
Very Active	≥ S3 *	No	20	15	10	5
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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